CORPORATE LESSONS LEARNED (CLL) SYSTEM
Mission Needs Statement (MNS)

1. MISSION AREA

The purpose of the Corporate Lessons Learned (CLL) system is to identify, capture, and reuse knowledge of the Corps' professional workforce. As our employees go about their jobs, the CLL will allow them to quickly identify repetitive deficiencies, critical problems, or successful business practices. CLL also allows these items to be evaluated by appropriate experts and applied in the future to realize technical and business process improvements that translate directly into improved cost, time, quality, and scope performance of Corps' facilities.

2. MISSION ENVIRONMENT

A review of Corps guidance documents and command memoranda (Appendix A) reveals that sharing lessons learned is an essential management objective of virtually all Corps' business areas. While there has been significant management emphasis given to lessons to learned the tools needed to support lessons learned capture, review, and sharing are currently not available. Attempts to centralize lessons learned to date have not been unsuccessful since users are unable or unwilling to access central 'knowledge stores.' Previous attempts to develop distributed systems have resulted in system designs that lack long-term sustainability. Stand-alone databases are also difficult to find by those outside a specific region and/or subject matter.

3. MISSION NEED

3.1. Capturing Lessons Learned

Within existing business processes there are many opportunities for the capture of lessons learned. At a minimum, these opportunities occur wherever employees must repair the results of repetitive deficiencies. Two examples of these opportunities are when design reviewers prepare design review comments on a set of final design documents or when quality assurance personnel prepare construction contract change orders. In both of these situations, employees should be able to "flag" problems for consideration beyond the scope of the current project. Currently, these opportunities to capture lessons learned are lost.

In the CLL system, lessons learned are easily captured through the "LL Module." The "LL Module" is a 'yes/no' button that allows users to identify and forward potential lessons learned for review. The 'yes/no' button is incorporated directly into one or more Automated Information Systems (AIS) where appropriate for a given business process. Where AIS's do not exist, direct input to the "LL Repository," described below is possible.

3.2.Evaluating Lessons Learned

If lessons were captured, there are local, regional or national expert whose current job includes the requirement to evaluate of request for changes to technical or policy guidance. Since lessons are rarely submitted to these personnel for review, guidance is often released with problems identified locally but not communicated to the drafters.

In the CLL system, lessons learned are automatically submitted to a "LL Repository." This repository is the location where pending lessons learned are evaluated by designated lessons learned experts. Repositories may be located at District, Division, or HQ level depending on the need of the business process that requires lessons learned capture.

Since the submitter may not know the technical experts needed to evaluate and resolve the pending item, an automated emailing from the repository clearly identifies those who will evaluate the new submission. The repository automatically reports status changes to all associated personnel.

3.3.Sharing Lessons Learned

Currently, some offices have stand-alone lessons learned databases associated with specific topics or specific technical subjects. These systems are primarily operated through local champions and have not been fully integrated into the business processes that produced the data. As a result employees rarely have the opportunity to utilize the corporate knowledge that has been gathered. Unless there is an easy-to-use method to automatically apply lessons learned, the paper or electronic documents will not be used. The problems are more difficult if multiple offices have lessons learned databases on different topics. Even if the employee wanted to use the data, it is unlikely that they would be able to find the locations of all relevant data sources.

In the CLL system, the "LL Registry" is the sharing mechanism that allows employees to quickly find lessons learned repositories across the country that relate to their current problem issue. The registry is the world-wide address book that identifies the locations of all repositories on all LL topics.

The CLL registry is designed to adapt to changes in content and scope of local and national lessons learned repositories. As new business processes or national lessons learned center is created, the location and method for accessing these repositories will automatically transmitted to a distributed set of CLL registries. New repositories and registries may be brought on-line without human intervention. An XML data exchange standard will be developed to allow the registries to communicate. The reliability of the distributed CLL approach is expected to be much higher than that of centralized databases or servers.

3.4.Sunsetting Lessons Learned

For those offices that have existing lessons learned databases or paper documentation, lessons learned that are no longer valid must be manually removed. Such a manual process means that the set of lessons learned being used are always out of date. Furthermore, such systems may collapse under the weight of data as information is accumulated but rarely, if ever, removed.

In the CLL system, the "National CLL Repositories" are the final arbiters of lessons learned that are national in scope. As items are submitted or approved locally they are also automatically sent the national CLL repository identified by the registry. As items are reviewed and approved at a national level automated feedback to the originator of the item is provided. When the item is incorporated into the next update to the appropriate guidance document, then the original submission is flagged as resolved both nationally and locally.

4. MISSION DEFICIENCIES.

Documentation of the requirements for this work was begun through Military Programs funded Research & Development (R&D) project entitled "Design Reviewers' Support Environment." The goal of this R&D project was to develop innovative techniques to improve design quality. The prototype of the CLL was created a part of this R&D project that completed in FY96. Documentation describing specific design requirements for CLL may be found in Appendix B.

Coordination with academic researchers at a number of American Society of Civil Engineers conferences confirmed that the need to develop a sustainable methodology for the capture, evaluation and sharing of lessons learned was of concern to both the public and private sectors. Participation in the Department of Energy's Lessons Learned Society helped to identify what approaches have, and have not been, successful at other government agencies. The CLL system also included as part of a Construction Industry Institute (CII) study on Lessons Learned.

As part of the R&D project, two workshops were held with Corps HQ, Division, District, and Resident Office personnel to validate the requirement and approach of the CLL. A Corps' employee from the Vicksburg District on long-term training at Georgia Tech verified that the CLL approach was the most effective approach to lessons learned. An inter-directorate task force created by the Corps' Board of Directors to review confirmed this opinion in 1997 and identified the CLL as the "best of breed' when compared with 47 other systems and approaches to lessons learned. The Office of Secretary of Defense identified the CLL system as a quality management "Best Practice" for Quality Management in December 1998.

5. IMPACT OF DEFICIENCIES ON THE MISSION.

There is a continuing pressure on the Corps to produce projects "better, cheaper, and faster" than the competition. An effective lessons learned method has the potential to improve both the direct execution of projects and also the business processes that enable project execution. Through effective lessons learned processes we can avoid mistakes or share good decisions that would otherwise cause construction time and cost overruns or decrease project quality.

A subtle but very powerful aspect of a lessons learned system is that ability of Corps' business processes to respond directly to approve input related to customer specific and location specific criteria. Not only will Corps' customers provide input to the CLL system but they are able to track how and when each item they submit gets translated into changes to Corps' standard operating procedures or technical requirements.

6. SECURITY, INTERFACE AND INTEROPERABILITY REQUIREMENTS

The first level of security on the CLL system is that of the AIS in which the "LL Module" is included. The "LL Module" a component of each existing AIS therefore security of CLL is based upon existing AIS security.

The remaining three components of the CLL system, the "LL Repository," "LL Registry," and "LL National Repositories" operate across the World Wide Web. Currently, Internet Explorer Version 5.0 is the required minimum browser for CLL. During initial programming changes will be made to support Netscape's version 4.0 or later browser also.

Java Applets and ActiveX controls are not used in CLL since these types of programs may be blocked by corporate firewalls.   Java Scripts are currently used for such tasks as display of menu options and pop-up windows. It is expected that some Java Scripts will always be required for complete operation of CLL.

Security over the Internet is based upon a two-tiered password system. After users correctly enter both an office and personal password an encrypted security key is placed on the users' browser. Passwords for office and user will be reset to random seven alphanumeric character fields every six months.   Distribution of CLL passwords is a function of a local CLL administrator's job and subject to local office requirements.

7. PROJECTED FUNCTIONAL BENEFITS

Every year or two there are highly visible examples of projects being constructed with deficiencies that were known by some, but not all, in the organization. Without effective communication methods such problem are inevitable due to the variety of customers, locations, and facility types the Corps builds. With effective lessons learned

sharing and use mechanism built into users' daily business process of users, such problems will virtually disappear.

Allowing customers to participate in the identification of customer and location specific criteria will strengthen the bond between the Corps and its customers. The CLL has the effect of raising the barrier to entry for potential Corps' competitors.

8. RETURN-ON-INVESTMENT (ROI)

During each year of use in areas related to program execution, a direct relationship between cost and use of CLL should be able to be established as CLL items result in faster, less expensive and better facilities. Independent audits by the Corps' Inspector General can provide specific examples and project the possible cost savings as CLL is implemented across business areas.

9. CONSTRAINTS AND ASSUMPTIONS IMPACTING ALTERNATIVES.

The cost of web-based software has a significantly lower long-term cost of ownership than either stand-alone PC-Based software or traditional thick-client/server software. The only draw back to using web-based software is that users must have access to the Internet to utilize the system. Since all Corps offices, with the exception of construction trailers at remote sites now have email and Internet capability, the constraint of access to the web is insignificant.

CLL repository and registry services will be provided on a distributed network of web-servers. A subscription service will be provided through CERL to allow Districts, Divisions, and HQ business process proponents to share a bank of network servers. Business process proponents may elect to host their own CLL repository and registry services, however, experience with the CLL prototype installed at ten Districts and on National Center has indicated that the cost of the subscription service is significantly less than that of self-hosting.

A commercial Internet Service Provider (ISP) currently hosts the CONUS prototype CLL server at www.buildersent.org. The ultimate platform for CLL will most likely be a combination of self-hosted and subscription CLL servers. The decision as to the final platform will be made based on a match between cost and functionality.

The prototype CLL repositories and registry have been written in MS Access 97. While a more robust database platform may be required for high volume transactions, prototype testing has indicated that the number of transactions is unlikely to justify the cost of Oracle. To install Oracle on the current prototype CLL web server would add an additional $130K on-time fee plus very high annual fees.

The design of the current prototype CLL repositories and registry will be upgraded, as the data tables are coordinated with the Command Data Model. The impact of translation

of the CLL data elements to correspond exactly, versus providing a translation table, will be evaluated. If the translation to one-to-one correspondence with the Command Data Model may be accomplished within projected budget, then such a translation will be accomplished.

10. RESOURCES.

10.1.　　One-Time Costs (see notes below)

Activity	Estimated Cost	Source
Design Review LL (*a*)	completed	(CEMP, R&D)
CLL Registry (*b*)	$200K	(to be determined)
Data Exchange Format (*c*)	$200K	(to be determined)
Add CLL Module (per AIS)	$150K	existing AIS Budget (*d*)
Update Repository (per AIS)	$ 50K	existing AIS Budget (*d*)

Notes:

a) The CLL module is currently included in the Design Review and Checking System (DrChecks). There are currently ten Districts using DrChecks. Pacific Ocean Division has standardized on the use of CLL for capture of Division LL. A national repository for lessons learned related to the Whole Barracks Renewal Program has also been funded by CEMP-EE.

b) This work allows us to design, implement and test a distributed, robust CLL Registry that can direct users to CLL registries for business processes outside the current "design quality" business process.

c) The data exchange format will be an XML-based technique to support the automated communication among distributed CLL Registries.

d) After the first new CLL system to be included, the Resident Management System (RMS), new AIS's participation in CLL may either be funded as line items in that AIS's budget or a separate line items in the CLL budget. The decision on which approach to use will be based on management's decision of the importance placed on CLL features for a given business process.   The CLL Module component will add the 'yes/no' lessons learned submission button to the appropriate location within an existing AIS. The repository update will support the addition of additional indexing and routing features need to support the additional AIS.

10.2.　　Recurring Costs (see note below)

Activity	Estimated Cost
One man-year for telephone hotline support	$100K
One-half man-year for program enhancements	$ 50K
One-half man-year for user group communication	$ 50K
Total	$200K

Note: The recurring costs for the first three years of operation are shown below. As additional business processes or lessons learned repositories come on-line the cost is expected to rise slightly. This rise will be primarily in increasing user group communication tasks from one-half man-year to one man-year. The total recurring costs is not expected to exceed $250K

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Appendix A Lessons Learned Citations.

The list below gives an idea of the scope of Corps' business processes that are interested in sharing lessons learned. This list was obtained through a search of the Corps' on-line publications.

"A Guide To Effective Contractor Quality Control (CQC)," EP 715-1-2 February 1990.

"Command Involvement in Reporting of USACE Serious Accidents," Memorandum for Commanders and Directors, 4 February 1998.

"Design and Construction Practices for Concrete Pavements," ETL 1110-3-488, Appendix B, 1 March 1998.

"Design Policy For Military Construction," ER 1110-345-100, 15 February 1994

"EEO Conciliation Report," in ER 690-1-693, 23 July 1997.

"Effectively Working With State And Federal Regulators," EP 200-1-9 19 August 1998.

"Engineer-Memoirs - Major General Hugh J. Casey, US Army," EP 870-1-18, December 1993.

"Engineering And Design Ordnance And Explosives Response Engineer Regulation," ER 1110-1-8153, 14 May 1999.

"Environmental Quality Chemical Quality Assurance For HTRW Projects," EM 200-1-6, 10 October 1997.

"Geospatial Data And Systems," EM 1110-1-2909, 1 August 1996.

"Guidance for Leasing BRAC Properties," Memorandum for Commanders and Directors, 13 June 1996.

"Hazardous Toxic Radioactive Waste (HTRW) Resident Engineer Guide," EP 415-1-266, 15 December 1994.

"Hydraulic Design of Small Boat Harbors," EM 1110-2-1615, 25 September 1984.

"Information Technology/Information Management (It/Im) Strategic Plan (Version 1.0) For Fiscal Years 1998–2003," Planning Document, January 1998.

"Lessons Learned from City National Bank of Miami v. U. S.," Memorandum for Division and District Commanders, 17 April 1995.

"Lubricants And Hydraulic Fluids," EM 1110-2-1424, 28 February 1999

"PARC Instruction Letter 96-8, Redelegation of Authority for Research and Development Grants, Cooperative Agreements and Other Transactions," Memorandum for Commanders and Directors, 28 October 1996.

"Planning and Design of Navigational Dams," EM 1110-2-2607, 31 July 1995.

"Post Completion And Design Criteria Feedback Inspection," ER 415-3-11, 20 Feb 1991.

"Program and Project Management," ER 5-1-11, 27 February 1998.

"Quality Assurance Responsibilities," Memorandum for Major Subordinate Commands, 9 June 1988.

"Quality Management," ER 1110-1-12, 1 June 1993.

"Resident Engineer Management Guide," EP 415-1-260, 6 December 1990.

"Safety And Occupational Health Policy," EC 385-1-218, 3 May 1999.

"Sand Bypassing System Selection," EM 1110-2-1616, 15 October 1980.

"Travel Management," OM 55-1-1, 31 January 1990.

"Technical Requirements for specifications to Report HTRW Environmental Restoration Cost and Performance," EP 1110-1-19, November 1996.

"Thermal Spraying: New Construction and Maintenance," EM 1110-2-3401, 29 January 1999.

"Tidal Hydraulics," EM 1110-2-1607, 15 March 1991.

Appendix B. Research and Development Project Publications.

Nguyen, Tuan H., East, E. William, Vanegas, Jorge A. (1998) *The Use of Organizational Knowledge within Public Works Engineering Construction and Maintenance Agencies*, USACERL Special Report 98/54.

East, E. William (1998) *Web-enabled Design Review and Lessons Learned*, USACERL Technical Report 98/31.

E. William East (1997) "Lessons Learned Systems in the U.S. Army, Corps of Engineers," Invited presentation at the Department of Energy Lessons Learned Society, Conference Proceedings.

East, E. William (1997) *Design Review and Related Lessons-Learned Systems in the U.S. Army Corps of Engineers*, USACERL Conference Proceedings 97/71.

East, E. William, Fu, Michael (1996) "Abstracting Lessons Learned from Design Reviews," American Society of Civil Engineers, *Journal of Computing in Civil Engineering*, 10(4), pp. 267-275.

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